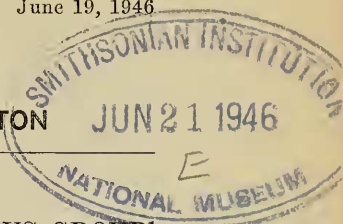


PROCEEDINGS
OF THE
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THE AEDES (STEGOMYIA) ALBOLINEATUS GROUP¹
(DIPTERA, CULICIDAE)

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Recent collections made by the authors in the Philippine Islands have disclosed 5 new species of the subgenus *Stegomyia* which in general appearance resemble *Aedes* (*Stegomyia*) *albolineatus* (Theobald). These, along with *pseudalbolineatus* Brug form a section of *Stegomyia* that is distinct enough to be considered a group of that subgenus.

Edwards³ considered *albolineatus* as a member of the *scutellaris* group. In this group he also included *albopictus* (Skuse) and its related species.

The *albolineatus* group, as based on the species known at present, is characterized by: a diamond-shaped anterior area of narrow white scales on the median portion of the vertex; a single broad longitudinal pleural band of white scales that begins on the propleuron and extends posteriorly across the upper portion of the sternopleuron and the upper mesepimeron; having only the first three tarsal segments of the hind legs marked with basal white areas (a few white scales may occasionally occur on segment IV); the scutum being marked with a conspicuous longitudinal median white stripe; and the dististyle having its appendage well removed from the apex.

Key to Adults of the Albolineatus Group

1. All three lobes of scutellum largely covered with broad white scales 2
 Only mid scutellar lobe with broad white scales, lateral lobes covered with broad black scales 5
2. Median stripe of scutum extending posteriorly to the scutellum (female unknown) *bambusicolus*, new species
 Median stripe of scutum extending only to level of wing bases 3
3. An area of broad white scales on the lateral margin of the scutum just before level of wing base *laffooni*, new species
 No area of broad white scales on lateral scutal margin 4

¹The collections reported on here were made under the auspices of U. S. Naval Medical Research Unit No. 2. The material was worked up in space furnished by the Division of Insects, U. S. National Museum and by Johns Hopkins University (School of Public Health and Hygiene).

²Division of Research, Bureau of Medicine and Surgery, U. S. Navy Department.
³Edwards, F. W., 1932. Genera Insectorum, Culicidae. Fasc. 173, p. 161. F. Wytsman, Brussels.

4. Only about basal two-fifths of third hind tarsal segment marked with white (female only, male cannot be separated).
arboricolus, new species
 Most, or all, of third hind tarsal segment marked with white
pseudalbolineatus Brug⁴
5. Scales of *apn* and *ppn* all dark..... *albolineatus* (Theobald)
 At least some of the scales of *ppn* pale, usually some pale scales on
apn also 6
6. Median scutal stripe extending posteriorly to scutellum; *ppn* with narrow curved creamy scales only..... *hoogstraali*, new species
 Median scutal stripe extending posteriorly only to level of wing bases; *ppn* with narrow dark scales dorsally and broad white scales below *boharti*, new species

Key to the *Albolineatus* Group Based on Male Genitalia

1. Lateral plate of mesosome with less than 10 teeth..... 2
 Lateral plate of mesosome with more than 10 teeth..... 3
2. Basistyle with 2 distinct prominences and with 4 bladelike specialized setae near the more basal of these lobes; dististyle appendage at basal one-seventh (Fig. 8)..... *bambusicolus*, new species
 Basistyle with one prominence (bears 3-4 very stout short spines) and without bladelike specialized setae; dististyle appendage inserted just beyond middle (Fig. 21)..... *albolineatus* (Theobald)
3. Lateral teeth of mesosome narrow and slender (Fig. 10); dististyle appendage very long and slender (Fig. 20)
hoogstraali, new species
 Lateral teeth of mesosome broad, tapered, blade-like (Fig. 13); dististyle appendage broader and shorter (Fig. 22)..... 4
- 4.⁵ Tips of strongest basal lobe spines reaching level of apex of basistyle; hairs of inner dorsal (before rotation) margin of basistyle with hairs as long as those on basal lobe (Fig. 23)
arboricolus, new species
lafoonii, new species
 Tips of strongest basal lobe spines falling well short of level of basistyle apex; hairs of inner dorsal margin of basistyle short, usually conspicuously shorter than those of basal lobe (Fig. 22) *boharti*, new species

Aedes (*Stegomyia*) *albolineatus* (Theobald). 1904.

Entom. 37: 77 (female) (*Scutomyia*). TYPE-LOC.: Kuala Lumpur, Malay Peninsula (Leicester). TYPE: Female in British Museum.

MALE (Philippine specimens). Wing about 2½ mm. Head:—Proboscis and palpi black. Palpus approximately one-half to two-thirds (observed range 0.48-0.65) the length of the proboscis, latter about four-fifths the length of the abdomen. Antenna dusky, torus densely clothed on inner aspect with broad white scales. Vertex with a median longitudinal band of broad white scales, widening anteriorly, a broad somewhat diamond-shaped area of narrow white scales wedged deeply into the anterior margin of this band and extending anteriorly between the eyes, laterally these narrow scales extend far enough along the eye margins

⁴We have not seen specimens of this species.

⁵From Brug's description, *pseudalbolineatus* would key here. However, it is not possible to separate it from *arboricolus* and *boharti* on the basis of his description.

so as to cut off the broad white scales and the first of the broad black scales from the eye margins; remainder of vertex covered with broad black scales, except for a line of broad white scales on a level with the lower portion of *apn* (this may be reduced to a few scales or even absent) and a patch of similar scales in the lateral corner; a narrow area of black forked scales on the nape. *Thorax*:—Scutum dark, covered with black narrow scales, a median longitudinal stripe of white narrow scales that widens slightly from the anterior margin to a level with the postspiracular area and then tapers rather abruptly to an end just before the level of the wing bases; a line of short golden bristles over the wing base. Scutellum with mid lobe clothed with broad white scales, frequently a few apical broad dark scales, lateral lobes clothed entirely with broad black scales. *Apn* with sparse narrow black scales, *ppn* with sparse narrow black scales dorsally. Pleuron with a large triangular area of broad white scales on the ventro-posterior portion of the sternopleuron in addition to the dorsal band. Coxae covered with broad white scales. Fore femur dark scaled, a small basal pale area ventrally on the anterior surface, a median longitudinal white stripe on the posterior surface, sometimes a small kneespot present; mid femur dark, a narrow white anterior kneespot, ventral margin marked with white that extends slightly onto the anterior and posterior surfaces; hind femur white scaled, the dorsal aspect black from apex nearly to base, the dark scaling extending subapically onto the anterior surface for a slight distance, the apical half of the posterior surface black, this black extending onto the ventral aspect subapically and occasionally just encroaching on the anterior surface. Tibiae dark, ventro-posterior scales and hairs paler. Fore and mid tarsi dark; hind tarsus with first 2 segments basally banded with white, the bands being about one-fourth the length of the segment and incomplete mesally, occasionally a few white scales basally on III. Halter pale with dark-scaled knob. *Abdomen*:—Tergites black-scaled with large lateral white patches on I-VII (basal on II-VII), becoming subbasal dorsally on II-VII, usually produced on dorsum to form narrow subbasal bands on VI and VII and occasionally on V and even IV. *Genitalia* (Figs. 17 and 21):—Basistyle conical, about 1 by $2\frac{1}{2}$, dorsal surface with several rows of long stout hairs that possess recurved tips; basal lobe with 3-4 stout spines and several slender hairlike setae at apex. Dististyle about half the length of the basistyle, tapering to a curved tip; appendage inserted just beyond middle and extending almost to the tip of the dististyle. Lateral plate of mesosome with a dorsal row of 5-7 apical stout teeth. Tenth sternite armed apically with a short, stout single or double process. Ninth tergite with an irregular row of 3-6 setae on each side.

FEMALE (Philippine specimens). Wing about $2\frac{1}{2}$ to 3 mm. Differs from the male chiefly as follows: Palpus about one-seventh to one-eighth the length of the proboscis. Median scutal stripe slightly broader than in the male. Fore femur occasionally with a few anterior apical white scales; mid tarsus frequently with a few white scales basally on the first 2 segments; hind tarsus with first 3 segments with broad basal white areas, that on II forming a complete band, occasionally a few pale scales basally on IV.

A certain amount of variation occurs in the adults of this species. Specimens were seen from Guadalcanal and New Georgia that differed

from the above description in having some or all of the median upright forked scales on the nape dusky to yellowish in color; in having the scutal stripe of the female wider (about width of median white area on the vertex) and that of the male somewhat narrower; in having a complete subapical black band on the hind femur (occasionally narrowly broken ventrally on anterior aspect); and in having complete or nearly complete bands on abdominal tergites II to VII (occasionally even a few pale scales on I). Specimens from New Guinea also possessed a more or less complete subapical band on the hind femur but otherwise did not appear to differ from Philippine material.

LARVA. The larva of *albolineatus* presents a striking range of variation; in fact, so much variation occurs as to make it almost inconceivable that only one species is present. However, a series of 116 larval skins from Guadalcanal, New Guinea, Morotai and the Philippines have been examined, and in no case was it found possible to detect more than one species in the associated adults. It is not inconceivable, of course, when progeny rearing is done from single egg batches, that it may be found possible to separate *albolineatus* into 2 or more species on the basis of the larva.

For descriptive purposes, the larva of this species has been divided into types. The common type of the Philippines has been described in some detail and is used as a basis for describing the others. On all characters except the number of branches of head hair 6, there seems to be a small amount of intergradation between the types. Two or more of these types may occur in the same breeding spot.

Type A (Series of 10 associated Philippine specimens from Samar and Luzon). *Head* (Fig. 1):—Antenna with a few very fine spicules scattered over basal one-half; length about $7\frac{1}{2}$ -8 times the width; hair tuft inserted slightly beyond middle, 3 branched (range 2-5). Median mouth brush hairs with fine comb-like tips.⁶ Preclypeal spine, pale, elongate and slender. Head hair 4⁷ with 12-20 branches; 5 with 10-20; 6 single, rarely double; 7 with 10-25; 8 single; 9 with 2-4; 12 many-branched; 13 single; 15 with 2-4; 17 with 2-7; 18 with 3-10; 20 with 2-4; hairs 4 and 6 anterior to 7, 5 behind and slightly mesad to 6, position of 4 in relation to 6 apparently variable. Mentum with first 2-3 teeth short and widely spaced, the remainder closely and evenly ranked, 9-12 lateral teeth. *Thorax*:—Integument with minute scattered spicules. Some of the hairs produced into stout stellate tufts, 8-19 branched. Meso- and metapleural hair tufts with a stout basal spine. *Abdomen* (Fig. 4):—Integument with minute scattered spicules. Some of the dorsal and ventral hairs developed into stout stellate tufts, 6-19 branched. Dorso-lateral hair of segment I is 3-9 branched, lateral hair single, both hairs on or at the margin of opposite ends of a bar-like plate. Comb scales strongly developed, thorn-like, quite variable in length, a fine fringe present on basal portion of spine, scales arranged in a straight line, 9-12

⁶Unless the mouth brush hairs are completely extruded, this point is difficult to determine. Larval skins seldom have these brushes completely expanded, only about one in ten being so in the authors' collection. Comblike tips were seen on types A and B but not on C and D. However, not enough specimens of the latter were seen to be sure of the validity of this.

⁷In order to have a nomenclature for the ventral head hairs, Marshall is followed in naming the hairs of the head. Marshall, J. F., 1938. The British Mosquitoes. p. 45. British Museum, London.

in number. Siphon smooth, index about 2.4-2.8; detached acus present (rarely a very narrow attachment to the siphon); single subventral hair tuft, attached approximately at middle, 3-5 branched; pecten teeth 3-6 in number, posterior margin fringed, frequently both margins of posterior teeth fringed. Anal plate incomplete ventrally, posterior margin with a fringe of spines; lateral hair stout, single, occasionally 2-3 branched; *isc* 5-8 branched; *osc* single; ventral brush with 10 tufts, of which all but the most anterior two arise from a connected barred area, each tuft with about 5-6 branches; anal gills finger-like, rarely somewhat broadly lanceolate, upper pair slightly longer than the lower pair and about twice the length of the anal plate (observed range 1.6-2.2 times length of plate).

Type A was collected only in the Philippines. However, there is a variant of it that occurs in Gaudalcanal, New Guinea and Morotai. In this, the body integument and siphon are covered with fine pile (visible under low power, 160x); the spines on the anal segment are more strongly produced; and the ventral head hairs tend to have more and stronger branches (thus approaching Type B).

Type B (Series of 10 specimens from New Guinea, Morotai and Luzon). Similar to Type A except as follows: Head hair 5 with 5-11 branches; 9 with 3-4; 15 with 2-8; 17 with 6-12; 18 with 8-16. Body integument and siphon densely covered with stout pile, that on the body being branched. Lateral hair of anal plate 2-4 branched, rarely single; posterior spines strongly produced. Material seen from New Guinea, Morotai, Samar, Balabac and Luzon.

Type C (Series of 10 specimens from Guadalcanal, New Guinea, Morotai, Samar and Luzon). Similar to Type A except as follows: Antenna longer, length about ten times the width, spicules scattered over whole length. Head hair 6 with 6-11 branches; 9 with 2-4 (one had 7). Body integument with fine pile, sometimes nearly invisible at 160x. Siphon with fine spicules or bare. Lateral hair of anal plate 1-4 branched.

Type D (Series of 5 specimens from Morotai, Samar and Luzon). Similar to Type A except as follows: Antenna longer, length about ten times width. Head hair 6 with 7-11 branches; 9 with 3-5; 15 with 3-5; 17 with 8-11; 18 with 8-12; 20 with 3-5. Body integument with prominent branched pile; siphon pilose. Lateral hair of anal plate 2-3 branched; spines on posterior margin of anal plate strongly produced.

Brug (1939)⁸ discusses the variability of the *albolineatus* larva and illustrates the differences of antennal length, of the branching of the dorsal head hairs and of the length of the posterior spines on the anal plate.

This species breeds commonly in tree holes, coconut shells and bamboo stumps, and more rarely in artificial containers and fallen leaves. Bonne-Webster and Brug (1932)⁹ also report it as breeding in leaf axils of sago palms and *Colocasia*; and in a rockhole, lagoon and jungle pool.

PUPA. Figures 11, 12 and 18 illustrate the pupa arising from the Type A larva. Although some variation occurs in number of branches and of position of setae in a series of *albolineatus* pupae arising from

⁸Brug, S. L., 1939. Tijdschr. v. Ent., 82: 102-104.

⁹Bonne-Webster, J., and Brug, S. L., 1932. Geneesk. Tijdschr. v. Nederland.-Indie 72 (Bijblad 2): 63.

the different types of larvae, there appears to be no significant difference between them.

TAXONOMIC DISCUSSION. From Theobald's original description of *albolineatus*, it cannot be told if his type is that species as understood here, or *boharti*. However, a female specimen in the U. S. National Museum collected in the type locality of *albolineatus* possesses only narrow curved black scales on *apn* and *ppn*, and thus agrees not only with the material in the authors' collections, but also with Barraud's (1934)¹⁰ conception of *albolineatus* (Assam). The only published figure of the mesosome of *albolineatus* is that by Brug (1939),⁸ and is presumably of a Ceram specimen. It agrees well with all the material studied.

There are specimens of *albolineatus* in the authors' collection from Guadalcanal, Solomon Islands; Hollandia, New Guinea; Morotai, Moluccas; and Mindanao, Balabac, Samar, and Luzon in the Philippines. Material was examined in the U. S. National Museum from the additional areas of Rendova and Munda Point, (W. G. Downs), Florida (K. L. Knight), Treasury Islands (J. H. Paullus) and Bougainville (A. B. Gurney, C. R. Bruck) in the Solomon Islands; Milne Bay (W. V. King, T. K. Ruebush, W. S. Ferguson, H. R. Roberts, G. H. Bick), Saidor (W. S. Ferguson), Kiriwinia (W. S. Ferguson), Dobodura (B. E. Rees), Finschafen (E. S. Ross) and Toem, east of Sarmi (E. S. Ross), all in New Guinea; Tarakan, Borneo (A. G. Humes); and Kuala Lumpur, Malay Peninsula (A. T. Stanton). This species has also been recorded from New Britain, New Ireland, Riouw, Sangir Islands, Ceram, Saparoea, Krakatoa Group, Indochina, and Assam.

Aedes (Stegomyia) pseudalbolineatus Brug, 1939

Tijdschr. v. Ent. 82: 103 (male and female). TYPE LOC.: Undesignated. Type series from Celebes and Sangir Islands. TYPE: Male in British Museum.

According to Brug the male can be distinguished externally from that of *albolineatus* only by the all white scutellum.¹¹ The genitalia differs in that the hairs on the basal lobe are stout and almost as thick as the 4 spines, and in that the lateral mesosomal plate possesses 14-16 dorsal teeth. The female has the additional character that the third hind tarsal segment is largely white on three sides, leaving only the fore side, and sometimes a narrow apical band, black. The type series was reared from a broken bottle, bamboo stumps and tree holes. Brug states that the larva falls within the range of variability found for *albolineatus*, the only difference he could find being that the outer occipital hair (hair 9) has 6-10 branches as against 2-3 (once 4 and once 5) in *albolineatus*. This number for *albolineatus* also holds for the rather considerable number of specimens (60 examples of hair 9, range in number of branches 2-5) examined by the authors.

Aedes (Stegomyia) arboricolus, new species

MALE. Wing about $2\frac{1}{2}$ mm. Undistinguishable from the type description of the male of *pseudalbolineatus* Brug. Distinct from *albolineatus* on scaling of scutellum and the prothoracic lobes, and on male geni-

¹⁰Barraud, P. J. The Fauna of British India. 5:243. Taylor and Francis, London.

¹¹In a recent communication, Dr. John Smart, British Museum, states that the specimens of *pseudalbolineatus* in their collection have all the scales of *apn* and *ppn* broad white.

talic characters. Palpus approximately three-fifths (observed range 0.54 to 0.66, holotype 0.66) the length of the proboscis. A few narrow curved cream-colored scales on lateral margin of scutum between level of mesothoracic spiracle and of wing base. All three scutellar lobes clothed with broad white scales, the apex of the mid lobe with a few broad black scales, also a few similar apical scales on the lateral lobes. *Apn* with both broad and narrow white scales; *ppn* with sparse narrow black scales dorsally, broad white scales below. Fore and mid tarsi dark; hind tarsus with first three segments basally marked with white, the marking on I incomplete on mesal aspect, that on II about one-half the length of the band on I and narrowly complete mesally, that on III consisting of only a few lateral scales. Abdominal tergites with narrow subbasal white bands on VI and VII. Genitalia (Figs. 14, 19 and 23) with basistyle conical, about $1 \times 2\frac{1}{2}$; inner dorsal surface with several irregular rows of rather long hairs, a number of long stout setae on ventral and outer surface; basal lobe with 3-4 elongate spines (tips reach level of basistyle apex) and several long stout setae with slender curved tips. Dististyle about one-half length of sidepiece, tapering to a blunt point at tip; appendage insertion ranging from just before middle to just beyond, apex of appendage not reaching the tip of the dististyle. Lateral plate of mesosome with row of 13-16 dorsal teeth. Tenth sternite armed apically with a 1-3 lobed process. Ninth tergite with 4-10 hairs on each side.

FEMALE. Wing about 3 mm. Resembles the male in most respects. Similar to type description of *pseudalbolineatus* except for marking of the third hind tarsal segment. Palpus about one-eighth the length of the proboscis. Hind tarsus with first three segments with basal white bands, that on I about one-fourth the length of the segment and incomplete mesally, that on II about two-fifths the length of the segment and complete although narrowed mesally, that on III about two-fifths the length of the segment and incomplete mesally, occasionally a very few basal pale scales present on IV. Abdominal tergites with partially complete subbasal bands on IV and V, complete on VI and VII.

LARVA (Series of 12 associated skins and 2 larvae, all from one collection) (Figs. 2 and 3). Generally similar to Type B. *albolineatus* larva except for the shape of the anal gills: Head hair 5 with 8-13 branches; 9 with 4-8 (once 3); 15 with 3-6; 17 with 11-19; 18 with 12-17; relative position of anterior dorsal head hairs variable. Comb scales strongly developed, thorn-like, smooth, the spine about twice the length of the base, tightly arranged in an even single line, about 12 in number (range 11-16). Siphon index 2.4 to 3.1; 3-5 pecten teeth. Anal plate with posterior fringe of strong spines, the longest at least half the length of the anal plate in length. Anal gills tapered from base, occasionally somewhat lanceolate, dorsal pair just slightly longer than the anal plate (1.05-1.15), ventral pair somewhat shorter than the dorsal pair.

PUPA. Generally similar to that of *albolineatus*. A significant difference appears to occur in the greater number of branches of hair 1 of the seventh abdominal segment (*arboricolus*: 24 examples, range 4-8, average 6.1 branches; *albolineatus*: 155 examples, range 1-3, average 1.8).

TYPES. *Holotype*.—Male, with larval and pupal skins and genitalia (U. S. National Museum Cat. No. 57769). Shohoton Springs, inland on the Basey River, Samar, May 8, 1945 (K. L. Knight), reared from a large

open tree hole. *Paratypes*:—4 males, 7 females, with associated larval and pupal skins, 3 males and 2 larvae without associations, same data as for type. Paratypes deposited in U. S. N. M., Johns Hopkins University and California Academy of Sciences.

TAXONOMIC DISCUSSION. From *pseudalbolineatus* (type description, since no specimens were available for comparison), *arboricolus* is distinct in the female in having only about the basal two-fifths of the third hind tarsal segment marked with white. Brug (1939)⁸ describes *pseudalbolineatus* as having most of the third hind tarsal white on three sides, leaving only the fore side, and sometimes a narrow apical band, black. Apparently neither the male nor the larva are distinct from those of *pseudalbolineatus*. Brug states that the male of *pseudalbolineatus* differs from *albolineatus* only in scutellar and genitalic differences. This would imply that *apn* and *ppn* possess dark scales only, which would furnish a further differentiation point between *arboricolus* and *pseudalbolineatus*.¹¹ In the larva, this species is generally distinct from *albolineatus* on the shape of the anal gills and on the number of branches of head hair 9. However in some cases sufficient variation occurs so as to make identification difficult.

Aedes (*Stegomyia*) *boharti*, new species

Aedes (*Stegomyia*) *albolineatus* (Theobald), Bonne-Wepster and Brug, 1932, *Geneesk. Tijdschr. v. Nederland.-Indie* 72 (Bijblad 2): 60 (Fig. 14, male genitalia; description of male in part).

MALE. Wing about 2 mm. Closely similar to *albolineatus*, but readily distinguished by the scaling of *apn* and *ppn*, and by the structure of the mesosome. Palpus approximately three-fifths (observed range 0.5-0.7, holotype 0.7) the length of the proboscis. *Apn* usually with narrow black scales and with a variable amount of narrow and broad white scales; *ppn* with narrow dark scales dorsally and broad white scales below, a few narrow white scales generally present along the margin of the white broad scales. Lateral scutellar lobes clothed with broad black scales, median lobe with broad white scales only. Genitalia (Figs. 9, 13 and 22) with basistyle conical, $1 \times 2\frac{1}{2}$, some long stout setae on ventral and outer surface, hairs on inner dorsal surface usually quite short, sometimes nearly as long as in *arboricolus*, basal lobe with three stout spines (tips fall well short of basistyle apex) and a number of shorter setae, those on the upper part of the lobe stout and resembling spines. Dististyle tapering to tip; appendage inserted at, or beyond, middle and extending about to apex of dististyle. Lateral plate of mesosome with a row of 11-16 teeth on dorsal margin. Tenth sternite ending in a blunt, 1-3 lobed process. Ninth tergite with 3-5 hairs on each side.

FEMALE. Wing about $2\frac{1}{2}$ - $3\frac{1}{2}$ mm. Similar to the female of *albolineatus* except for the scaling of *apn* and *ppn* as described for the male.

LARVA. Two main types of larvae give rise to *boharti* adults. These are separable, as with *albolineatus*, on whether head hair 6 is single or multiple.

Type D (Holotype and 7 paratypes, all associated skins, Samar and Luzon):—Apparently not distinguishable from Type D of *albolineatus*, except on shape of anal gills. Inner mouth brush hairs with comblike tips. Antenna 9-11½ times longer than wide; hair tuft 2-5 branched. Head hair 5 with 12-19 branches; 6 with 4-8; 7 with 10-16; 9 with 2-8;

12 with 11-17; 15 with 1-7; 17 with 10-18; 18 with 10-20. Mentum with 9-14 lateral teeth. Comb scales 8-12 in number, the spines at least as long as the bases; some or all of the teeth may be joined basally. Siphon index approximately 3; 3-6 pecten teeth; hair tuft 2-4 branched. Lateral hair of anal plate 2-4 branched. Anal gills tapered from base, dorsal pair only slightly longer than ventral and about $1\frac{1}{2}$ times longer than anal plate (3 specimens all measured 1.4). A series of unassociated larvae from Luzon have the anal gills broadly lanceolate and subequal to the anal plate in length. An associated specimen each of *albolineatus* and *boharti* was reared from this collection. The gills of the *boharti* specimen are somewhat lanceolate and are slightly longer than the anal plate. This would indicate that the unassociated specimens are possibly *boharti*. However, that gill type was never seen in any of the other associated *boharti* material.

Type B (10 associated skins from Culion, Palawan, Samar and Luzon):—Apparently not distinguishable from Type B of *albolineatus*, except on shape of anal gills. Inner mouth brush hairs with comblike tips. Antenna $7\frac{1}{2}$ -10 times longer than wide; hair tuft 1-4 branched. Head hair 5 with 5-15 branches; 6 single, rarely 2-branched; 9 with 2-6; 15 with 2-6; 17 with 12-19; 18 with 10-17; 20 with 2-5. Mentum with 9-13 lateral teeth. Comb scales 9-16 in number, the spines at least equal to the bases in length, occasionally nearly twice the length of the base, some or all the teeth may occasionally be joined basally. Siphon index approximately 2.5-3.0. Lateral hair of anal plate 2-4 branched; posterior spines about half the length of the anal plate. Dorsal anal gills approximately $1\frac{3}{4}$ times length of anal plate (observed range 1.3-2.2), gills tapered from base, rarely lanceolate.

The larva of *boharti* is apparently not separable from that *arboricolus*.

PUPA. No significant pupal differences can be correlated with the above 2 larval types. Nor can the pupa of this species be separated with certainty from that of *albolineatus*. It is true, however, that in *boharti* hair 1 of the seventh abdominal tergite on the average possesses more branches (33 examples, average 3.5, range 2-6) than that hair in *albolineatus* (155 examples, average 1.8, range 1-3). Similarly, *boharti* differs from *arboricolus* on the number of branches of hair 10 of the second abdominal segment (*boharti*: 25 examples, range 1-5, average 2.8; *arboricolus*: 21 examples, range 3-10, average 5.4).

TYPE. *Holotype*:—Male, with larval and pupal skins, and genitalia (U. S. National Museum Cat. No. 57770), Osmena, Samar, May 15, 1945 (A. E. McMillan and M. J. MacMillan), reared from coconut shell halves in the vicinity of a native habitation. *Paratypes* (34 males, 52 females, all with associated larval and pupal skins, year 1945):—1 male and 2 females, same data as for holotype; 4 females, Osmena, Samar, June and August; 4 males and 5 females, Balinsasayao, Leyte, June; 2 females, 1,000 ft. elevation, slopes of Mt. Lobi, Leyte, August; 1 male and 1 female, Irahuan River, Palawan, June; 1 female, Bacungan, Palawan, June; 1 male and 1 female, Culion Island, June; 2 males, Cape Melville, Balabac Island, June; 13 males and 15 females, Subic Bay, Luzon, June, July and August; 10 males and 14 females, San Ramon, Mindanao, September; 2 males and 7 females, Zamboanga, Mindanao, September. The paratype series was collected by D. R. Johnson, Jean Laffoon, A. E. McMillan, L. E. Rozeboom, K. L. Knight, E. Bogusz, E. S. Zolick, F. E.

Zedeck and M. J. MacMillan. The paratypes are deposited in U. S. N. M., Johns Hopkins University and the California Academy of Sciences.

The paratypes were all reared from coconut halves, bamboo stumps, tree holes, banana stumps, palm stump hole and from a water bucket in the woods. Other specimens were captured as adults when aroused from resting places in deep woods. On at least one occasion, 2 specimens were captured biting man in the woods. This species apparently is more abundant in the Philippines than *albolineatus* (see distribution).

No definite locality was given for the male specimen that Bonne-Wepster and Brug mentioned, but apparently it was from somewhere in the Dutch East Indies.

This species is dedicated to Dr. Richard M. Bohart.

Aedes (Stegomyia) hoogstraali, new species

MALE. Wing about $2\frac{1}{2}$ mm. Similar to *albolineatus*, but differing markedly in scutal and genitalic characters. Palpus approximately five-sixths the length of the proboscis. Proboscis slightly shorter than the abdomen. Head with median area as in *albolineatus*, laterad to this is an area of broad black scales that is approximately the same width as the median white area, frequently a band of white scales present in this dark-scaled portion, lateral corner of head with pale broad scales, a narrow area of small black forked scales on the nape. Scutum (Fig. 6) dark, densely clothed with hairlike black scales, marked with a complete median longitudinal line of hairlike white scales, the line increasing slightly in width to the level of the postspiracular area, then tapering gradually to the prescutellar space, the portion that extends through the prescutellar space widening slightly to the same width as the midscutellar lobe and with parallel sides, scales at posterior margin of prescutellar portion of the line broad and undistinguished from mid lobe scutellar scales; lateral scutal margin from level of posterior edge of *ppn* to level of wing base with creamy-white narrow-curved scales. Mid lobe of scutellum with broad white scales, lateral lobes with broad black scales. *Apn* and *ppn* with narrow-curved creamy-white scales only. Hind femur white, a black subapical band that is ventrally incomplete on both surfaces. Fore tarsus with a small basal white patch on I; mid tarsus with a white basal patch on I and a few basal white scales on II; hind tarsus with prominent white basal bands on the first three segments, that on III incomplete ventrally. Abdomen with complete subbasal bands on tergites V to VII. Genitalia (Figs. 10 and 20) with basistyle cylindrical, about 1×3 , several irregular rows of short curved-tipped hairs dorsally, basal lobe with 3 stout spines, 2-3 stout setae and 2-3 slenderer setae apically. Dististyle half the length of the basistyle, tapering to a blunt apical point; appendage inserted at basal third and extending almost to apex of dististyle, long, slender, acutely tapered. Lateral plate of mesosome with a dorsal row of 13-15 rather thin teeth. Tenth sternite ending in a 1-2 lobed blunt process. Ninth tergite with 4-5 hairs on each side.

FEMALE. Wing about 3 mm. Palpus only about one-sixth the length of the proboscis. Legs marked as in male except that the fore femur possesses an anterior kneespot; the mid tibia is entirely dark. Remainder as in male.

LARVA. Apparently two slightly different larval types occur in this species, although not sufficient larval material is available to be com-

pletely sure. The two types are separable on the branching of head hair 6 and on the length of the antenna. The larva of *hoogstraali* is distinct from the other species described in this paper on the absence of prominent thoracic and abdominal stellate tufts and on the form of the comb and peeten teeth.

Type A (Series of 3 associated larval skins). *Head*:—Antenna with a few very fine spicules scattered basally; $8\frac{1}{2}$ - $9\frac{1}{2}$ times longer than wide, hair tuft inserted just beyond middle, single. Median mouth brush hairs with comblike tips. Preelypeal spine pale, elongate and slender. Head hair 4 many branched; 5 with 8-11 branches; 6 single; 7 with 10-14; 9 double; 15 with 4-5; 17 with 2-4; 18 with 2-6; 20 with 3-4; hairs 4 and 6 anterior to 7, 5 behind and slightly mesad to 6. Mentum with first 2-3 teeth separated, acute, the remainder rounded and evenly ranked, 10-11 lateral teeth. *Thorax*:—Mesothoracic pleural hair tuft with stout basal spine which may be split into several points; metathoracic pleural hair tuft with similar but smaller spine. *Abdomen* (Fig. 5):—Dorso-lateral hair of segment I is 4 branched, lateral hair single, the hairs located at opposite ends of a small barlike plate; the lateral hairs of II-VI double, rarely one or more single. Comb scales with broad oval bases, the spines narrow thornlike, equal to or somewhat less in length than the basal portion, very fine fringe on basal portion and extending onto base of spine, 6-10 in number. Siphon smooth, index approximately 2.5; acus present, a basal line at point of attachment, acus occasionally entirely detached; single subventral hair tuft approximately at middle, 4-6 branched; 3-6 peeten teeth, each with a group of basal spines. Anal plate incomplete ventrally, dorso-posterior margin with small area of short spines; lateral hair double; *isc* 4-5 branched; *osc* single; ventral brush with 10 tufts, each tuft 2-4 branched, the most anterior 2 not attached to a lateral bar. Anal gills broad fingerlike, dorsal pair slightly longer than ventral pair and 1.3-1.9 times longer than the anal plate.

Type B (Two associated larval skins). Similar to Type A except as follows: Antenna ten times longer than wide, hair tuft 1-2 branched. Head hair 5 with 14-20 branches; 6 with 3; 15 with 4-5; 17 with 1-2; 18 double. Dorso-lateral hair of abdominal segment I is 6-8 branched. Dorsal pair of anal gills 2.8 times length of anal plate.

PUPA. Similar to *albolineatus* except as follows: Vertical plate differently shaped (Fig. 15). Trumpet shorter and broader (Fig. 16). Hairs 4 and 6 of the cephalothorax not appreciably different in length from hair 5. Hair 6 of abdominal segments IV-V (usually III also) is mesad of a longitudinal line through 10. Hair 1 of VII lies mesad of a longitudinal line through 2 and is nearer the posterior margin of the segment than the lateral margin.

TYPES. *Holotypes*:—Male, with larval and pupal skins and dissected genitalia (U. S. National Museum Cat. No. 57771), Subic Bay, Luzon, June 27, 1945 (E. S. Zolick and F. E. Zedeck), reared from bamboo stump. *Paratypes* (6 males, 8 females):—1 female, with larval and pupal skins, same data as for type; 3 males and 5 females, with larval and pupal skins, 2 males and 2 females, Subic Bay, Luzon, July 1945 (M. J. MacMillan, L. E. Rozeboom, F. E. Zedeck), reared from bamboo stumps; 1 male, Subic Bay, Luzon, July 1945 (M. J. MacMillan), reared from a tin can.

The paratypes are deposited in U. S. N. M., Johns Hopkins University and California Academy of Sciences.

This species is dedicated to Mr. Harry Hoogstraal.

Aedes (*Stegomyia*) *bambusicolus*, new species

MALE. Wing about $2\frac{1}{2}$ mm. Externally, somewhat intermediate between *hoogstraali* and *pseudalbolineatus*, but differing markedly on genitalia from any of the *albolineatus* group. The following points of difference from *albolineatus* occur: Palpus nearly as long as the proboscis (0.97 of the proboscis length). Scutum (Fig. 7) dark, covered with hairlike black scales, a median longitudinal stripe of hairlike white scales, tapered to level of the wing bases from where it continues onto the bare prescutellar space as a narrow line, a few broad white scales medially on posterior margin of scutum, a few broad black scales laterally, a band of broad white scales extending from level of mesothoracic spiracle to level of wing base on extreme lateral margin of scutum, a small patch of narrow curved ochreous scales above wing base. Scutellum clothed with broad white scales. *Apn* densely covered with broad white scales, *ppn* with narrow white scales dorsally and broad white scales below. Fore femur black with a narrow white kneespot and a few basal pale scales anteriorly, posteriorly broadly white on basal half, reduced to a line on apical portion; mid femur with a white kneespot, a ventral pale line anteriorly, posterior surface all white basally, the white extending narrowly along ventral margin to near middle, a white ventral line at apex. Hind femur white, a broad complete subapical dark band. Fore tarsus dark with white basal patch on I; mid tarsus dark with pale basal patch on I, a few basal white scales on II; hind tarsus with broad basal white bands on first three segments, that on I about one-third of the segment, that on II about one-half and that on III about two-thirds. Abdominal tergites with complete subbasal bands on IV to VII. Genitalia (Fig. 8) with basistyle conical, 1×2 , dorsally with several rows of very long stout bristles; a lobe-like prominence on inner dorsal surface near the base, a number of long stout setae with slender curved tips arising from this prominence, 4 large curved blade-like specialized setae inserted just dorsally to this prominence; basal lobe with a dense covering of long stout setae but without distinctly enlarged spines. Dististyle slender, almost as long as basistyle, sharply angled before apex, the tip truncate, appendage short, tapered, rodlike and located at basal one-seventh. Lateral plate of mesosome with 7-8 dorso-apical teeth. Tenth sternite ending in a long slender blunt process. Ninth tergite with 5 hairs on each side.

FEMALE, LARVA and PUPA. Unknown.

TYPES. *Holotype*.—Male, with mounted genitalia (U. S. National Museum Cat. No. 57772), Culion Island, June 20, 1945 (D. R. Johnson and Jean Laffoon), reared from bamboo stump. *Paratype*.—1 male, same data as for holotype. Paratype deposited in U. S. N. M.

Aedes (*Stegomyia*) *laffooni*, new species

MALE. Wing about 2 mm. Similar to *albolineatus*, but differing markedly in scutal, scutellar and genitalic characters (for separation from the other species, see key). The following points of difference from *albolineatus* occur: Scutal stripe widest at midpoint of length; an area of broad white scales extending forward from level of wing base to

level of postspiracular area on lateral margin of scutum. Scutellum clothed with broad white scales, some broad dark scales apically on each lobe. *Apn* and *ppn* clothed with broad white scales, a few narrow dark scales dorsally on *ppn*. Mid tarsus with a few white basal scales on I; hind tarsus with first 3 segments basally banded with white, those on I and III being incomplete medially, the band on I being about one-fourth the length of the segment and those on II and III about one-third. *Genitalia*:—Apparently not distinct from that of *arboricolus*.

FEMALE. Wing about 3 mm. Similar to the male except as follows: Fore femur with a few anterior apical white scales; subapical dark area of hind femur only slightly extended basally on dorsal aspect (not reaching middle); mid tarsus with lateral basal white scales on first 2 segments; hind tarsus with basal white bands on first 4 segments, incomplete medially on all except II, the band on I about one-fourth to one-third the length of the segment, on II-IV one-third to nearly one-half.

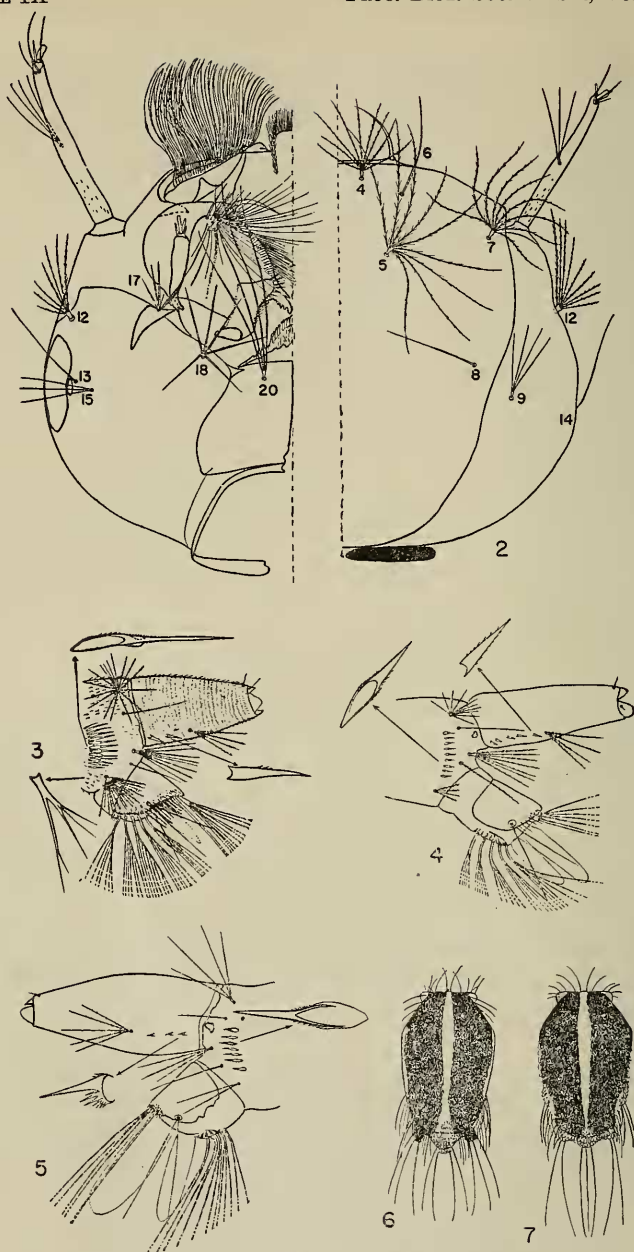
LARVA and PUPA. Unknown.

TYPES. *Holotype*:—Male, with mounted genitalia (U. S. National Museum Cat. No. 57876), 2 miles inland from San Ramon, Mindanao, about 500' elevation, September 17, 1945 (Jean Laffoon), reared from tree hole in dense jungle. *Paratypes*:—2 females, same data as for holotype; 1 female, Maasin Village, Zamboanga Province, Mindanao, September 25, 1945 (Jean Laffoon), collected as an adult in a nipa palm swamp. Paratypes deposited in U. S. N. M.

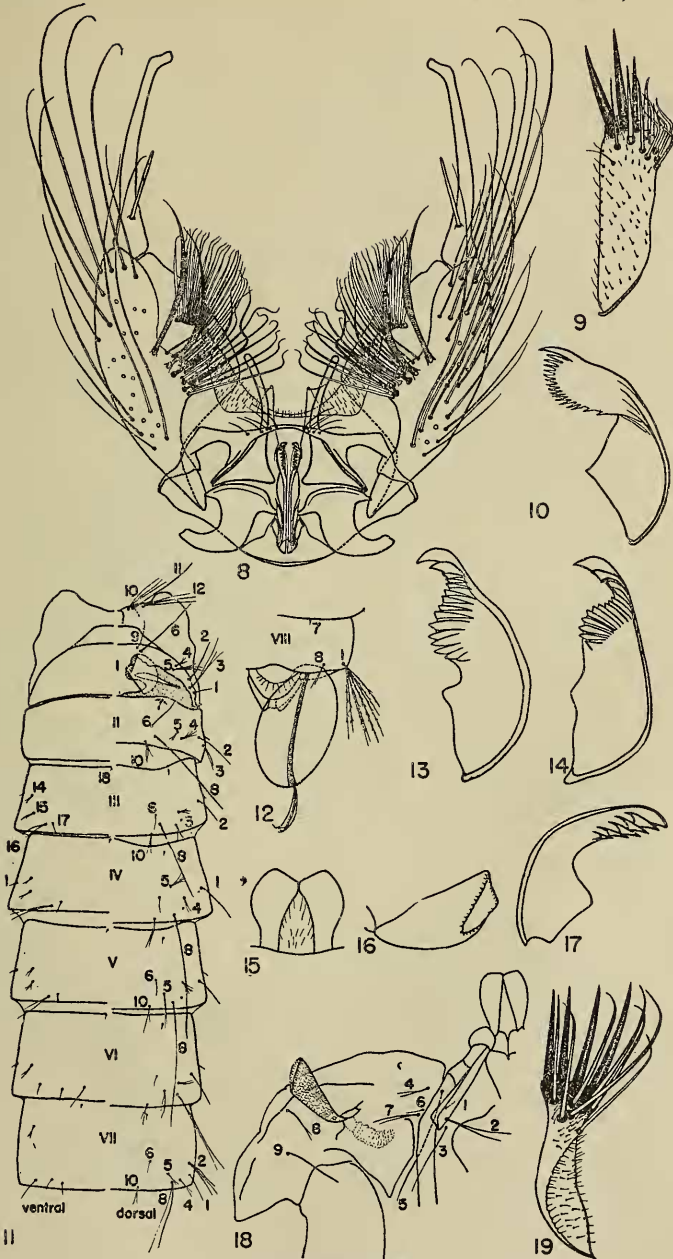
This species is dedicated to the collector.

EXPLANATION OF PLATES

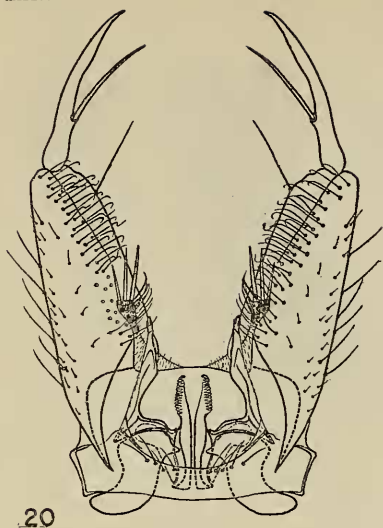
- Figure 1. *A. albolineatus*. Ventral aspect of larval head.
- Figure 2. *A. arboricolus*. Dorsal aspect of larval head.
- Figure 3. *A. arboricolus*. Lateral aspect of larval terminal segments.
- Figure 4. *A. albolineatus*. Lateral aspect of larval terminal segments.
- Figure 5. *A. hoogstraali*. Lateral aspect of larval terminal segments.
- Figure 6. *A. hoogstraali*. Dorsal aspect of anterior prothoracic lobes, scutum and scutellum.
- Figure 7. *A. bambusicolus*. Dorsal aspect of anterior prothoracic lobes, scutum and scutellum.
- Figure 8. *A. bambusicolus*. Male genitalia.
- Figure 9. *A. boharti*. Basal lobe of male genitalia.
- Figure 10. *A. hoogstraali*. Lateral aspect of lateral mesosome plate.
- Figure 11. *A. albolineatus*. Metanotum and abdominal segments I-VII of pupa.
- Figure 12. *A. albolineatus*. Segment VIII and paddle of pupa, dorsal aspect.
- Figure 13. *A. boharti*. Lateral aspect of lateral mesosome plate.
- Figure 14. *A. arboricolus*. Lateral aspect of lateral mesosome plate.
- Figure 15. *A. hoogstraali*. Vertical plate of pupal cephalothorax.
- Figure 16. *A. hoogstraali*. Pupal trumpet.
- Figure 17. *A. albolineatus*. Lateral aspect of lateral mesosome plate.
- Figure 18. *A. albolineatus*. Cephalothorax of pupa.
- Figure 19. *A. arboricolus*. Basal lobe of male genitalia.
- Figure 20. *A. hoogstraali*. Male genitalia.
- Figure 21. *A. albolineatus*. Male genitalia.
- Figure 22. *A. boharti*. Male genitalia.
- Figure 23. *A. arboricolus*. Male genitalia.



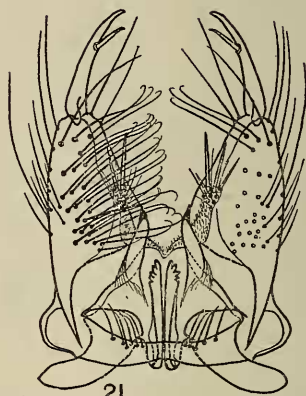
Details of *Aedes*



Details of Aedes



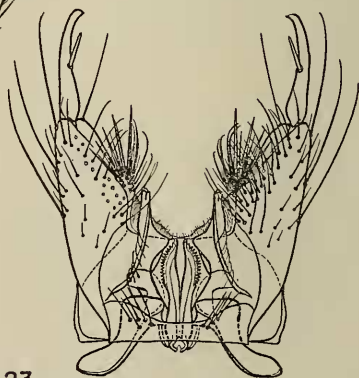
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